

CRITICAL COMPONENTS OF EFFECTIVE SCHOOL-BASED FEEDING IMPROVEMENT PROGRAMS

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ABSTRACT

This article identifies critical components of effective school-based feeding improvement programs for students with feeding problems. A distinction is made between typical school-based feeding management and feeding improvement programs, where feeding, independent functioning, and mealtime behaviors are the focus of therapeutic strategies. Critical components of effective feeding improvement programs include (a) therapeutic feeding methods for the purpose of maximizing current skills and compensating for deficits, (b) therapeutic strategies for improving feeding skills, (c) behavior management strategies for improving positive mealtime behaviors, (d) strategies for enhancing the nutritional value of foods consumed, and (e) positioning/posture modifications for enhancing swallowing safety and efficiency. Educational concepts and results of empirical research that provide the foundation and framework for these components are described.

As technological and medical fields have advanced, a greater number of children have survived serious illnesses and conditions than ever before (Arvedson & Brodsky, 1993). Many of these children have disabilities that affect the processes of feeding and swallowing. In a related trend, students with moderate to severe cognitive and/or multiple disabilities have been steadily moving from educational placements in clustered schools to home school placements. Home schools are those that students would attend if they were not disabled (Brown et al., 1989). Accordingly, the number of stu-

dents with medically based feeding problems has shown a dramatic increase in the public schools (Logemann & O'Toole, 2000). This is a trend that is expected to continue.

A wide range of feeding and swallowing issues can be problematic. Feeding problems range from negative and/or inappropriate social mealtime behaviors, to extreme food selectivity, to dysphagia, a dysfunction in the oral, pharyngeal, and esophageal phases of swallowing. Severe feeding problems, such as those that lead to marked nutrition and airway compromise, have been reported in 3% to 10% of children. These problems occur with greater prevalence in children with physical disabilities (Reilly, Skuse, & Problete, 1996), neurological disorders (Newman, Keckley, & Petersen, 2001) and in children born with low birth weights and prematurity (Sauve, Robertson, Etches, Byrne, & Dayer-Zamora, 1998).

Children with dysphagia often develop behavioral problems associated with feeding that persist after the organic problems have been resolved or that continue to co-exist with dysphagia (Burklow et al., 1998; Manikam & Perman, 2000). For some children, what began as a physiologically based feeding problem evolves into a strong behaviorally based problem. The occurrence of behavioral feeding problems in combination with organically based dysphagia has been well documented (Arvedson, 1997; Munk & Repp, 1994; Sisson & Dixon, 1986; Stark, Powers, Jelalian, Rape, & Miller, 1994). Behaviors often include acts such as food avoidance, small appetite, food refusal leading to poor weight gain or weight loss, disinterest in food, crying, spitting, gagging, throwing food, and other socially inappropriate mealtime behaviors such as not using a napkin when appropriate (Arvedson, 1997; Manikam & Perman, 2000).

When children with pediatric dysphagia and/or behavioral feeding problems reach school age, the feeding disturbances follow them to school, where many of these children receive special education and support services, such as physical, occupational, and speech and language therapy. The enigmatic mix of physical and behavioral feeding problems often presents a problem for both parents/caregivers and school personnel responsible for the child's educational and therapeutic programming. Unfortunately, treatment models developed to manage feeding problems in medical settings (e.g., Lefton-Greif & Arvedson, 1997) are not easily applied in educational settings.

The unique resources of the medical setting (i.e., access to physicians and other medical professionals, imaging and diagnostic equipment, and laboratory resources) are not a part of a typical school setting. Additionally, although school professionals are often expected or required to work with students exhibiting feeding problems, they often lack experience in the man-

agement of feeding problems and/or access to necessary resources, equipment, and/or staff development/training programs. This is particularly unfortunate and poses extreme risk to these students because the development of safe and efficient feeding skills is critical to all students' health and welfare and clearly affects their ability to receive an appropriate education. Furthermore, socially appropriate mealtime behaviors and independent feeding skills constitute critical life skills for students with disabilities.

A FEEDING IMPROVEMENT PROGRAM

It is important to note the difference between typical school-based feeding management in which the primary goal is to provide nutrition as safely as possible and a therapeutic program in which feeding skills, independent functioning, and mealtime behaviors are the focus of therapeutic strategies (a feeding improvement program) (Bailey & Angell, in press). Clearly, ensuring a child's safety and health at school is a priority for school personnel. It is also vital that school personnel foster advancements in the development of feeding skills, independent functioning, and appropriate mealtime behavior.

There are several critical components that make up a comprehensive school based feeding improvement program (Bailey & Angell, in press). These components require differing levels of expertise and training. While a basic understanding of the processes involved in normal and disordered feeding and swallowing is necessary for all personnel feeding and/or supervising children with feeding problems, the personnel involved with each program component also require a unique set of knowledge and skills. These critical components are the inclusion of therapeutic feeding methods, skill-building therapies, instructional strategies that match students' cognitive and physical abilities, methods for maximizing the nutrition and calorie benefit of foods provided, positioning for success, and the use of adaptive equipment to facilitate independence and compensate for deficits.

THERAPEUTIC FEEDING METHODS TO MAXIMIZE CURRENT SKILLS AND COMPENSATE FOR DEFICITS

Simply defined, therapeutic feeding methods are those alterations that a feeder makes when presenting food in order to match an individual's strengths, facilitate improved movement patterns, and compensate for deficits. These methods include strategies such as modifying the rate of food presentation (Pinnington & Hegarty, 2000), adjusting the volume of the bolus (Bisch, Logemann, Rademaker, Kahrilas, & Lazarus, 1994), applying external jaw control with feeding (Iammatteo, Trombly, & Luecke, 1990),

and alternating food consistencies (Ruark, McCullough, Peters, & Moore, 2002) and/or temperatures (Logemann, 2000).

Therapeutic feeding methods serve as a way to maximize the current abilities of each child. While they may also serve to enhance or encourage improvements in motor or sensory skills, they are primarily used as a compensatory tool. Therapeutic feeding methods build on the knowledge of each individual's current level of oral-motor functioning to maximize the safety and efficiency of feeding and swallowing.

The use of adaptive feeding equipment often serves a therapeutic function. When properly selected per each individual's skills and abilities, they can also serve to assist in the development of independence in self-feeding. Spoons with smaller, larger, flatter, or more curved bowls, bowls with raised sides for scooping, cups designed to limit liquid flows and spillage from the mouth, and straws designed to increase or decrease the amount of suction needed to raise liquid are just some of the available adaptive feeding materials available for this purpose. These items can serve a therapeutic function for individuals with feeding problems if they facilitate increased safety, maximization of oral-motor skills and abilities, and increased independence in self-feeding (Bailey & Angell, 2003).

INSTRUCTIONAL STRATEGIES TO FACILITATE THE DEVELOPMENT OF INDEPENDENT FEEDING SKILLS

Several instructional strategies have been identified as effective in teaching learners with severe and/or multiple disabilities. For example, systematic prompting strategies (Snell & Brown, 2000; Wolery, Ault, & Doyle, 1992), task analytic teaching and assessment (Alberto & Troutman, 2003), and a variety of positive reinforcement strategies (Alberto & Troutman, 2003) have been shown to be effective and efficient in facilitating skills acquisition by learners with severe and/or multiple disabilities. Applying what is known about instructional strategies to facilitate individuals' development of self-feeding skills may be another way to improve feeding and swallowing. Simply by allowing a person to self-feed or assist in lifting food to his/her mouth may add to that individual's awareness that a swallow is needed (Logemann, 2000). Caution is warranted when teaching self-feeding skills. It is important to remain aware of the effect of self-feeding on an individual's feeding and swallowing behaviors. The energy expended in self-feeding may increase the length of the mealtime or become physically taxing, and could lead to fatigue and decreased feeding and swallowing abilities. Fortunately, it is often possible to facilitate the development of skills by pacing self-feeding or by alternating self-feeding with being fed in order to minimize fatiguing effects.

THERAPEUTIC STRATEGIES TO IMPROVE FEEDING SKILLS

Deficiencies in oral-motor and oral-sensory skills often lead to difficulties in producing the necessary oral movements for safe and efficient drinking, biting, chewing, collecting and transferring the bolus from the front to the back of the mouth, and swallowing. Descriptions of the discrete oral-motor skills involved in eating and drinking have been identified elsewhere (Guerra & Vaughn, 1994; Logemann, 1998; Reilly, Skuse, & Wolke, 2000). When deficient skill areas have been determined, specific therapies designed to facilitate the development of skills should be employed. These therapies include both oral-motor stimulation and exercise programs.

Oral motor stimulation and exercises can be used directly (with food) or indirectly (without food) (Logemann, 1998). A therapist initiates the therapeutic process by facilitating the desired movement or skill indirectly, then adds direct practice once an individual is successful with the indirect practice. For example, the therapist might apply stimulation to the alveolar ridge and tongue tip with an infant toothbrush trainer (without food) in order to facilitate the upward movement of the tongue to the place of stimulation on the alveolar ridge. This is the movement that typically initiates the beginning of the oral stage of swallowing in a normal swallow (Logemann, 1998). When the individual is successful with the indirect practice, the therapist might dip the therapeutic tool in a substance such as yogurt and complete the stimulation again directly—this time with yogurt to swallow. This combination of indirect and direct practice may help to establish a desired feeding skill (tongue tip elevation to alveolar ridge).

It is important that direct therapeutic practice begin with foods an individual is familiar with and can safely swallow. The same goal (tongue tip elevation to alveolar ridge) could be targeted using a variety of methods. One method is the use of indirect resistance exercises to achieve the same skill target. For example, the therapist might push a flavored tongue blade against the individual's tongue tip while instructing him/her to push up against the blade.

Oral-sensory stimulation procedures include such activities as heightening the taste of the bolus, thermal-tactile stimulation, and direct stroking of the lips and oral cavity with gloved fingers or a therapeutic tool (Gisel, Birnbaum, & Schwartz, 1997; Logemann, 2000; Siktberg & Bantz, 1999). The purposes of oral-sensory stimulation are to heighten oral awareness and sensation and to increase tolerance in and around the face and mouth in order to improve a person's reaction to sensory stimulation such as food taste, texture, type, temperature, and the touch of a feeding appliance. While objective data regarding the efficacy of oral-sensory stimulation programs is

limited, many practitioners and researchers have reported clinical benefits of these programs (Alexander, 1987; Bailey, 2002; Gaebler & Hanzlik, 1996; Gisell, 1996; Helfrich-Miller, Rector, & Straka, 1986; Iammatteo et al., 1990).

BEHAVIOR MANAGEMENT STRATEGIES TO IMPROVE POSITIVE MEALTIME BEHAVIORS

Positive mealtime behavior management programs have been described by several authors (Kerwin, 1999; Luiselli, 1994; O'Brien, Repp, Williams, & Christophersen, 1991; Palmer, Thompson, & Linscheid, 1975; Rasnake & Linscheid, 1987; Sisson & Dixon, 1986). Recently, a positive reinforcement behavior management system has been found to be effective in improving mealtime behaviors within a school-based feeding improvement program (Bailey, 2002). Within this system, target behaviors were identified and sticker charts were prepared for token exchange systems (when feasible per individuals' abilities). Students were consistently reinforced for correct responding by receiving a sticker on the chart. A full sticker chart was exchanged for a small prize at the end of the meal.

For those who are not cognitively able to "work" for a sticker, reinforcer preference assessments (Gast et al., 2000) can be conducted to determine sensory reinforcers for individuals with feeding problems. Within this system, individuals are consistently given positive reinforcement for exhibiting desired target behaviors. Positive reinforcement is gradually and systematically faded as behaviors are performed more consistently. In order to effectively maintain and/or change programs to meet individual needs, performance data should be collected on a consistent basis. This will help to determine the efficacy of the positive reinforcement programs and indicate when programmatic changes are required.

There are several advantages of using positive reinforcement methods for the treatment of feeding problems. They include a more positive interaction style between the feeder and the person with feeding problems and an opportunity to therapeutically shape mealtime behaviors and feeding skills. Positive reinforcement methods also offer individuals less restrictive treatment environments than some other interventions (e.g., extinction) (Kerwin, 1999).

STRATEGIES TO ENHANCE THE NUTRITIONAL VALUE OF FOODS CONSUMED

Individuals with dysphagia often have difficulty maintaining adequate nutrition. Often, people with feeding problems require extra time and expend

much needed energy just to complete meals (Sullivan et al., 2000). This extra effort can lead to malnutrition. In Sullivan and colleagues' survey of 377 parents of children between the ages of 4 and 18 years with identified swallowing dysfunction, almost 40% of the parents surveyed did not recognize the signs of undernutrition and malnutrition in their children. Of all the survey respondents, 64% reported that their child's nutritional and feeding needs had never been specifically addressed by a healthcare provider.

For this reason, nutritional supports are often a necessary component of a feeding improvement program. Nutritional enhancement includes the incorporation of strategies such as increasing calories and nutritional values without necessarily increasing food amounts, and altering food consistencies, textures, and tastes to match individuals' preferences and oral-motor abilities (Kovar, 1997). Nutritional goals have been successfully included into the Individualized Educational Plans (IEPs) of students with identified feeding problems (George & Wellman, 2001). Obviously, consultation with parents/caregivers and professionals (e.g., physicians and registered dietitians) is necessary prior to modifying the nutritional content of foods provided to individuals with disabilities.

POSITIONING/POSTURE MODIFICATIONS

Proper position and body stability are important during feeding to facilitate a coordinated swallow pattern. A typical position for eating has been described as upright at approximately a 90-degree sitting position with hips, knees, and ankles flexed and feet flat on a surface. The head should be mid-line of the body with the chin slightly flexed for feeding (Siktberg & Bantz, 1999), and with arms and hands free to participate in self-feeding (Rosenthal, Sheppard, & Lotze, 1995). Unfortunately, due to physical limitations, optimal positions for eating may not be realized by many individuals with disabilities, thus affecting the feeding and swallowing processes. Adaptations may need to be made to facilitate the optimal position for each person.

Occupational and physical therapists working in school settings are often able to provide information and recommendations regarding facilitative strategies for improved positioning with therapies and adaptive equipment such as splints, assistive seating devices, head rests, and cushions. Seating and positioning systems are designed to provide necessary support for stability and mobility capabilities, but not to restrict potential movement (Arvedson, 1998). The goal of positioning modifications is to enhance airway protection while providing optimal alignment and structural support during feeding.

Once optimal body position has been achieved, postural changes may be used to facilitate improvements in swallowing (Larnert & Ekberg, 1995; Rasley et al., 1993). Typical postural changes include changes in position such as a chin down posture to protect the airway, head rotation toward the weaker side, and head tilt toward the stronger side. Optimal body positioning serves to protect the airway and enhance swallowing efficiency.

EDUCATIONAL CONCEPTS: MOTOR LEARNING THEORY

The educational concepts underlying the identified critical elements are three: (a) motor learning theory, (b) behavioral learning theory, and (c) the facilitation of learning through systematic instruction and active learning models. Motor learning theory suggests that the facilitation of improved motor control can be aided by the use of rhythmic, dynamic, and coordinated therapeutic exercise (Schalow & Zach, 2000) and that varying tasks for practice during the learning acquisition period may aid in the accuracy of performance of motor movements (Graydon & Griffin, 1996). The premise of motor skill learning theory is the idea that learning grows directly out of motor control processes and that these control processes can be tuned in to specific tasks, thereby improving motor performance and skill (Willingham, 1998). The therapeutic aim of the components identified as critical is to improve oral-motor performance for feeding and swallowing through the use of specific oral-motor stimulation and exercise routines, which are varied with repeated practice.

EDUCATIONAL CONCEPTS: BEHAVIORAL LEARNING THEORY

Behavioral learning theory explains that most human behaviors are learned responses to environmental stimuli. Behavioral theory can be traced to the work of Watson (1925), Pavlov (1927), Skinner (1953), and Bandura (1969; 1977) in the areas of respondent conditioning, operant conditioning, and model learning. These behaviorists showed in a variety of contexts that learning often occurs as a result of the consequences of behavior. A positive reinforcement strategy (e.g., delivery of social praise and tangibles such as stickers) is demonstrated when a behavior is followed by a consequence that increases that behavior's rate of occurrence (Alberto & Troutman, 2003). Many behavior managers, parents, and teachers employ positive reinforcement strategies to teach learners new skills, increase their current levels of adaptive behavior, and help learners maintain desired behaviors and skills. Effective feeding improvement programs implement positive reinforcement programs to improve students' feeding skills.

THE FACILITATION OF LEARNING THROUGH SYSTEMATIC INSTRUCTION AND ACTIVE LEARNING MODELS

Based on behavioral learning theory, systematic instruction involves identifying a target behavior and systematically delivering pre-determined antecedents and consequences to teach the targeted behavior. Target behaviors are any responses that have been identified as being an important focus of instruction. Antecedents are stimuli or events that occur immediately before a response and consequences are stimuli that contingently follow a response. The effects of systematic instructional procedures in teaching a variety of skills to students with severe or multiple disabilities have been reported by several researchers (Angell & Royston, 2003a, 2003b; Bailey, 2002; Mechling & Gast, 2003; Tekin-Iftar, 2003; Wall & Gast, 1997; Wall, Gast, & Royston, 1999). Critical components of effective feeding improvement programs should include the use of systematic instructional procedures in improving the feeding skills of students with feeding and swallowing problems. School personnel who participate in feeding improvement program sessions should actively engage students in the learning process and apply well-established procedures such as systems of response prompting that have been shown to be effective in teaching students with disabilities. School feeding team members must be adept at applying instructional data-based decision making which is a major component of systematic instruction.

CONCLUSIONS

The educational concepts of motor learning theory, behavioral learning theory, and the facilitation of learning through systematic instruction and active learning models form the basis for the implementation of a feeding improvement program. Research has shown that procedures based on these theories are effective in teaching learners with disabilities (Bailey, 2002; Zirpoli & Melloy, 2001). Based on a solid empirical research base, a feeding improvement program should employ therapeutic feeding methods, oral-motor stimulation and exercise programs, systematic instructional procedures, nutrition and positioning supports, and active engagement of learners in the improvement of their feeding skills and mealtime behaviors.

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